53

TOBACCO INDUSTRY RESEARCH COMMITTEE
350 FIFTH AVENUE NEW YORK 1, N. Y.

No comment

Salaries
Expendable Supplies
Application For Research Grant
Overhead
Other Direct Activity

Date: December 17, 1954

1. Name of Investigator: Hugh Montgomery, M. D.

2. Title: Associate Professor of Medicine, Medical School, University of Pennsylvania

3. Institution & Address: University of Pennsylvania
Philadelphia 4, Penna.

4. Project or Subject: Influence of tobacco smoking on the blood flow of skin and of muscles of extremities in sympathectomized and unsympathectomized subjects.

5. Detailed Plan of Procedure (Use reverse side if additional space is needed):

I recently requested a research grant from the Tobacco Industry Research Committee for studying the influence of tobacco smoking on the cutaneous temperature and cutaneous blood flow in human extremities. The Committee has suggested studies of blood flow in muscle and skin, and the influence of tobacco smoking on these, in sympathectomized and unsympathectomized extremities. To carry out the laboratory equipment is needed so first [illegible] are [illegible] for the [illegible] and have [illegible] experience in the [illegible] Normal subjects and subjects with peripheral arterial disease will be studied. An attempt will be made to choose patients about to undergo sympathectomy, so they can be re-studied after recovery from sympathectomy. The flow in skin will probably be studied in toes or fingers. Satisfactory measurements of skin temperature have been made during tobacco smoking in sympathectomized and normal individuals by Rappaport et al, Circulation 2, 850, 1950. Their plethysmographic measurements are not valid because the plethysmographic cup was applied to the toe and the cuff to the ankle. For most of the range of flow, skin temperature alone is sufficient, and we will repeat this work of Rappaport to know the magnitude of the skin flow change at the time that muscle flow is also being studied. The method will be that of skin temperature in constant temperature (to 5 C) cool room. We shall resort to plethysmographic measurements of toe flow only if that is needed to detect slight changes, at the higher range of flow where skin temperature measurements are not as sensitive to flow changes. (Felder, D., Russ, E., Montgomery, H. and Herwitz, O., Clinical Science, 13, 251, 1954). [illegible] in studying the [illegible]

Our initial measurements of muscle flow will be by needle thermocouple designed and built in our laboratory by Mr. George Peirce. The materials of the thermoelectric needle itself have already been accumulated. Recording by single channel Brown potentiometer will be possible as soon as that instrument can be obtained. It seems wise to bring at least one other instrument for measuring muscle flow into the study to make certain of the direction of changes in blood flow and to learn the general magnitude of the flow and of the changes in flow. For these purposes we are discussing the relative advantages of electrical impedence plethysmography and of electrical recording direct volume plethysmography, and think it best to include in the budget costs of both of these equipments.

It may be advisable to make some polarographic measurements to help substantiate the flow measurements, especially in the case of muscle. We are now wholly [illegible] equipped to make

1003541502

Source: https://www.industrydocuments.ucsf.edu/docs/txvm0000

polarographic measurements of oxygen tension in muscle as well as in skin; with extremities at complete rest and assuming no change in metabolism (oxygen uptake) of these two tissues, oxygen tension measurements may give good indication of flow. We have demonstrated this to be so in skin (Montgomery H. and Horwitz, O.: J. Clin. Invest., 39,1120, 1950) and Charles Wolferth, Jr. and Andrew Boyd, Jr. have shown a consistent relationship in dog muscle (unpublished).

1003541503

Source: https://www.industrydocuments.ucsf.edu/docs/[illegible]

6. Budget Plan (per annum)

Salaries	$4750.
Expendable Supplies	500.
Permanent Equipment	3100.
Overhead	2137.50
Other Social security	190.
Total	$10,667.50

7. Anticipated Duration of Work: Two years

8. Facilities and Staff Available: 2 constant temperature rooms, multiple thermocouples with electronic recording, air plethysmographs for use on digits, apparatuses and electrodes for measuring oxygen tension in intact tissues; electrodes for use in human muscle, a modern laboratory unit for research in circulatory problems, a supply of subjects and patients.

9. Additional Requirements: An electronic expert. Two research assistants with special skill in skin temperature work and plethysmography these to work approximately two days per week for a two year period under the Investigator's supervision.

10. Additional Information (Including relation of work to other projects and other sources of supply):

I recently requested a research grant from the Tobacco Industry Research Committee for studying the influence of tobacco smoking on the cutaneous oxygen tension and cutaneous blood flow in human extremities. The Committee has suggested studies of blood flow in muscle and skin, and the influence of tobacco smoking on these, in sympathectomized and unsympathectomized extremities. We have all the necessary equipment to make the studies we first suggested, are equally interested in the proposal by the Committee, and have considerable experience in the usual methods of measuring (plethysmographically) cross-sectional blood flow in the extremities of man and in animals. However, to carry out the proposed measurements of flow in muscle, I think it is highly desirable to use a method such as Hensel's "thermoelectric needle". Dr. Hensel's work in Dr. Henry Barcroft's laboratory at St. Thomas' Hospital in London (reported 4th Macy Conference on Shock & Princeton, Dec. 1954) has shown a good correlation between changes in muscle flow (intravenous adrenalin) measured by plethysmograph and by this needle, and no correlation with the rate of the disappearance of radioactive sodium. Calibration of the thermoelectric needle is not well established. The plethysmographic method suffers, in man from including skin as well as muscle. We are inclined to think the thermoelectric needle method will be the best with which to enter the study, but to quantitate the results it will be necessary to turn to plethysmography and it may be desirable to attempt some calibrations of the needle in perfused animal muscle as well. The reason for mentioning these factors is to justify considerable additions to the budget, because of the greater cost of equipment and need for an expert (Mr. Peirce) in designing and assembling the equipment.

[illegible] is thermocouple designed and built in our laboratory by Mr. Lucas Peirce. The principle of the thermoelectric needle itself have already been accumulated. Perhaps by a combination of two, quantification will be possible so that an [illegible] instrument can be obtained. It would also be handy to have one other instrument for measuring muscle flow into the study to learn certain of the direction of changes in blood flow and to learn the general magnitude of the flow and of the changes in flow. For these purposes we are discussing the relative [illegible] Signature Hugh Montgomery of electrical recording direct writing plethysmography, best to include in the budget both of them equipments.

Director of Project

It may be advisable to make some polarographic measurements to help substantiate the flow measurements, especially in the case of muscle.

Business Officer of the Institution Norman Topping
Vice-President in Chg. of Medical Affairs

1003541504

Source: https://www.industrydocuments.ucsf.edu/docs/txvm0000